

What is claimed is:

1. A magnetic bearing apparatus comprising:

a rotor;

a motor portion provided in the rotor for rotating the rotor by a magnetic force;

magnetically supporting coils for magnetically supporting the rotor in a radial direction in a predetermined position;

a magnetic force unbalance obtaining means for obtaining an unbalance of the magnetic force generated in the motor portion by the rotor run-out in the radial direction from the predetermined position and to be applied to the rotor; and

a magnetically support adjustment means for adjusting the magnetic force of the magnetically supporting coils so as to resist the unbalance of the magnetic force.

2. The magnetic bearing apparatus according to claim 1, wherein the predetermined position of the rotor may be the position obtained in the case where the rotor is rotated with the rotary axis of the rotor passing through the gravitational center of the rotor, or the position obtained in the case where the magnetic force of the coils are corrected so that the magnetic force to be applied between the coils and the rotor is kept constant for one cycle through which the rotor is rotated for the variation of the air gap of the magnetic coils and the rotor and generated when the rotor is rotated with the rotary axis of the rotor passing through the gravitational center

of the rotor

3. The magnetic bearing apparatus according to claim 1, wherein the motor portion is a brush-less DC motor composed of a plurality of magnetic poles fixed to a rotor and a plurality of coils arranged around the magnetic poles.

4. The magnetic bearing apparatus according to claim 3, wherein:

the apparatus includes:

a radial direction sensor for detecting the run-out in a radial direction of the rotor; and

a first estimating means for estimating the run-out in the radial direction of the motor portion from the geometric positional relation among the radial direction sensor and the motor portion, and from the run-out in the radial direction of the rotor which is obtained by the radial direction sensor, and that:

the magnetic force unbalance obtaining means comprising; a second estimating means for estimating the unbalance of the magnetic force acting on the rotor in the motor portion from the rotational angle of the magnetic poles, a magnetic field generated by the coil of the motor portion, and from the run-out of the motor portion in the radial direction inferred by the first estimating means.

5. The magnetic bearing apparatus according to claim 4, wherein the second estimating means is a database recording thereon:

the rotational angle of the magnetic poles;

the magnetic field generated by the coils of the motor portion;  
and

the unbalance of the magnetic force acting on the rotor in the motor portion with respect to the run-out of the rotor in the radial direction.

6. The magnetic bearing apparatus according to claim 2, wherein the magnetic force unbalance obtaining means comprising:

a magnetic flux detecting sensor for detecting the magnetic flux existing in an air gap between the magnetic pole and the coils of the motor portion;

a third estimating means for estimating, from the magnetic flux detected by the magnetic flux detecting sensor, the unbalance of the magnetic force of the motor portion.

7. The magnetic bearing apparatus according to claim 1,

a detecting means for detecting vibration generated by the rotation of the rotor;

a mechanism for controlling the magnetic force of the magnetic force supporting coils so that the vibration detected by the detecting means is reduced.